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(54) **Door system for a mass transit vehicle, comprising a wireless powerless switch sensor.**

Türanordnung für ein Nahverkehrsfahrzeug, mit einem drahtlosen stromlosen Schaltsensor.

Système de portes d'un véhicule de transport de masse, comprenant un capteur de commutation sans fil.

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DescriptionField of the Invention

[0001] The present invention relates to a door system for a mass transit vehicle, comprising a switch sensor for use in the door actuation mechanism .

Description of Related Art

[0002] Power door operators for mass transit vehicles have been developed to reduce the strain on vehicle operators caused by the repeated opening and closing of vehicle doors. An example of such a power door operator is described in U.S. Patent No. 6,125,768 which discloses a door system for transit vehicles that uses an electrically driven operator to open and close the doors of a mass transit vehicle. An exiting passenger using a touch bar or some other type of mechanical means can actuate such door operators. However, the use of a Radio Frequency Identification (RFID) system has not been envisioned for use as a mass transit door actuation means.

[0003] An RFID system begins with a "Tag" or "Transponder". The "Tag" or "Transponder" can be attached to or embedded within objects. An RFID reader sends out a radio frequency wave to the "Tag" and the "Tag" broadcasts back its stored data to the reader. The system works basically as two separate antennas, one on the "Tag" and the other on the reader. The data collected from the "Tag" can either be sent directly to a host computer through standard interfaces, or it can be stored in a portable reader and later uploaded to the computer for data processing. See U.S. Patent No. 6,863,220.

[0004] One of the advantages of an RFID tag system is that it performs effectively in environments with excessive dirt, dust, moisture, or poor visibility, such as in a mass transit door actuation device. Currently, RFID is used largely in retail functions, such as inventory control, product identification and tracking, and automated checkout.

[0005] Document WO 00/60374 discloses a portable remote device which includes a far call transmitter which may be part of a transceiver responding to a beacon or may be a transmitter (24a) responding to a switch (39) or both, so as to provide any or all of: panic alarms, calls for elevator service, authentication, access to vehicles, or access to buildings, garages or other spaces. The device also has an RFID portion which, when near the elevator, vehicle, garage or other space, responds to a beacon utilizing power provided by the beacon in a conventional fashion, whereby to assure access even though a battery of a transceiver or a transmitter may have failed. Instead of a battery, the transceiver or the transmitter may instead be powered by a stored energy section of the RFID portion of the device or by a microgenerator, thereby eliminating the need for a battery. The far transceiver or transmitter may be automatically turned off after use, and turned on by the RFID in response to a beacon.

[0006] Currently, switch status sensors require complex wiring, power supplies, and even micro-controllers in order for them to function properly. Accordingly, a need exists for a switch sensor that functions properly in environments with excessive dirt, dust, moisture, and/or poor visibility and a switch sensor that does not require complex wiring, power supplies, and/or micro-controllers.

SUMMARY OF THE INVENTION

[0007] The present invention is directed to a door system comprising a door and a passenger door open request system according to claim 1. The passenger door open request system includes a door operator for controlling the opening and closing of a door mounted to a door frame of a multi-passenger mass transit vehicle, a door open request switch mounted on the door, a controller comprising an RFID reader antenna and a logic unit, a circuit formed by connecting an RFID antenna with a control/storage element, and a switch connected between the antenna and the control/storage element. The logic unit of the controller is coupled to the door operator and the switch is coupled to the door open request switch.

[0008] Further details and advantages of the present invention will become apparent upon reading the following detailed description in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 is a schematic diagram of one embodiment of a wireless, powerless switch sensor useful in the present invention;

[0010] Fig. 2a is a perspective view of a multi-passenger mass transit vehicle door system implementing the present invention; and

[0011] Fig. 2b is a schematic diagram of another embodiment of a wireless, powerless switch sensor for use in a multi-passenger mass transit vehicle in accordance with the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0012] The present invention will be described with reference to the accompanying figures, wherein like reference numbers correspond to like elements throughout.

[0013] With reference to Fig. 1, a wireless, powerless switch sensor includes an RFID device antenna 1, connected in series with a switch 3 and an RFID control/storage element 5. The system also includes an RFID reader antenna 7 remote to RFID device antenna 1, switch 3, and control/storage element 5. RFID reader antenna 7 sends a Radio Frequency (RF) "request", which is received by RFID device antenna 1. The "request" allows control/storage element 5 to obtain enough power to turn on and respond as requested. Switch 3 is used to enable (i.e., switch is turned on) or disable (i.e., switch

is turned off) RFID device antenna 1. This allows the system to monitor the status of the switch since the system will only provide a response if switch 3 is closed. Therefore, a response would indicate a closed switch, while no response would indicate an open switch. The opposite is also true. Switch 3 could be configured to short out RFID device antenna 1. This configuration would provide similar functionality, but in this case a response would indicate an open switch and no response would indicate a closed switch.

[0014] Since the present invention uses RFID technology, a switch sensor is provided that performs effectively in environments with excessive dirt, dust, moisture or poor visibility. The wireless, powerless switch sensor of the present invention also eliminates the need for wires, power supplies, and micro-controllers needed in prior art switch sensor systems, thereby reducing installation and maintenance costs and providing increased reliability.

[0015] With reference to Figs. 2a and 2b, a door system for a multi-passenger mass transit vehicle includes a power door operator 9 and doors 11 pivotally mounted on a doorframe 13 of the mass transit vehicle. A controller 15 may be integrated into power door operator 9 or it may be located anywhere inside the mass transit vehicle, such as area 17. Controller 15 includes logic circuitry 19 and an RFID reader antenna 7'. The system further includes a door open request switch 21. Door open request switch 21 is comprised of an RFID device antenna 1', a switch 3', and an RFID control/storage element 5'.

[0016] The system functions as follows: RFID reader antenna 7', activated by logic circuitry 19 in controller 15, repetitively transmits and awaits a response. If switch 3' is configured as shown in Fig. 2b (i.e., open), no response will be received by RFID reader antenna 7'. When a passenger presses door open request switch 21, switch 3' is closed connecting RFID control/storage element 5' to RFID device antenna 1'. RFID control/storage element 5' is thereby energized by the signal transmitted from RFID reader antenna 7'. RFID control/storage element 5' in turn transmits a response received by RFID reader antenna 7' that provides an indication to logic circuitry 19 of controller 15 that the state of switch 3' has changed. This indicates that a door open request has been received. Controller 15 then signals power door operator 9 to open doors 11 to allow the passenger to exit the mass transit vehicle.

Claims

1. A door system comprising a door (11), and a passenger door open request system for a multi-passenger mass transit vehicle comprising:

a door operator (9) for controlling the opening and closing of said door (11) mounted to a doorframe (13) of said multi-passenger mass transit vehicle;

a door open request switch (21) mounted on said door (11);

a controller (15) comprising an RFID reader antenna (7') and a logic unit (19), wherein the logic unit (19) of the controller is coupled to the door operator (9);

a circuit formed by connecting an RFID antenna (1') with a control/storage element (5') and a switch (3') connected between said RFID antenna and said control/storage element, wherein the switch is coupled to the door open request switch (21).

15 Patentansprüche

1. Türsystem umfassend eine Tür (11) und ein System für passagierseitige Anforderungen zur Türöffnung bei Mehrpersonen-Massentransportfahrzeugen, umfassend:

einen Türbetätiger (9) zum Steuern des Öffnens und Schließens der Tür (11), die an einem Türrahmen (13) des Mehrpersonen-Massentransportfahrzeugs montiert ist,

einen Türöffnungsanforderungsschalter (21), der an der Tür (11) befestigt ist,

eine Steuereinheit (15), die eine RFID-Leseantenne (7') und eine Logikeinheit (19) umfaßt, wobei die Logikeinheit (19) der Steuereinheit mit dem Türbetätiger (9) gekoppelt ist,

einen Schaltkreis, der durch Verbinden einer RFID-Antenne (1') mit einem Steuer-/Speicherelement (5') und einem zwischen der RFID-Antenne und dem Steuer-/Speicherelement eingebundenen Schalter (3') gebildet ist, wobei der Schalter mit dem Türöffnungsanforderungsschalter (21) gekoppelt ist.

20 Revendications

1. Système de porte comprenant une porte (11), et un système de demande d'ouverture de porte de passager pour un véhicule de transport en commun multi-passager comprenant :

un dispositif de commande de porte (9) pour commander l'ouverture et la fermeture de ladite porte (11) monté sur un cadre de porte (13) dudit véhicule de transport en commun multipassager ;

un commutateur de demande d'ouverture de porte (21) monté sur ladite porte (11) ;

un contrôleur (15) comprenant une antenne de lecteur RFID (7') et une unité logique (19), dans lequel l'unité logique (19) du contrôleur est couplée au dispositif de commande de porte (9) ;

un circuit formé en connectant une antenne RFID (1') à un élément de commande/mémorisation (5') et à un commutateur (3') connecté entre ladite antenne RFID et ledit élément de commande/mémorisation, dans lequel le commutateur est couplé au commutateur de demande d'ouverture de porte (21).

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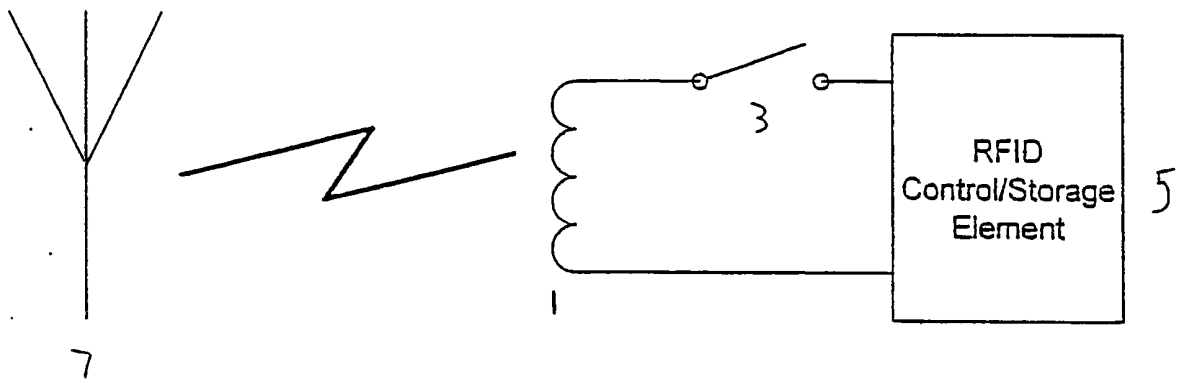


Fig. 1

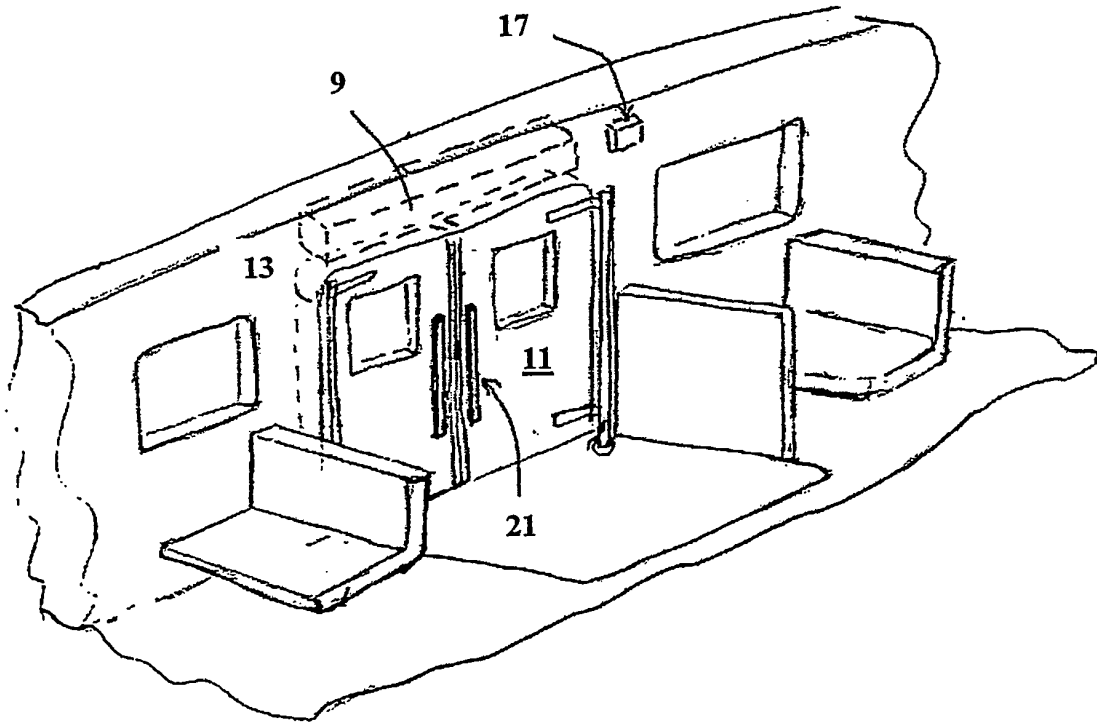


Fig. 2a

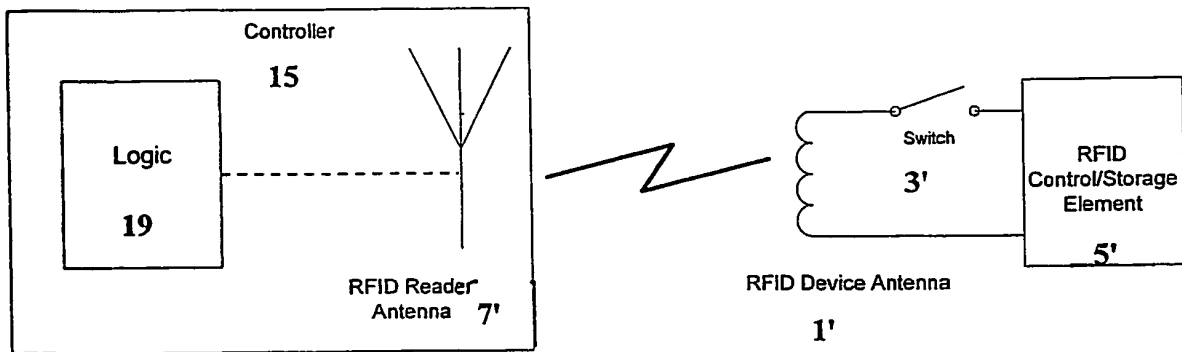


Fig. 2b

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6125768 A [0002]
- US 6863220 B [0003]
- WO 0060374 A [0005]